

SOIL SURVEY OF BASTROP COUNTY, TEXAS.

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DESCRIPTION OF THE AREA.

Bastrop County comprises an area of 928 square miles.^a The county is situated a little southeast of the center of the State of Texas, being crossed by parallel 30° N., and lying just to the west of meridian 97° W. It is bounded by Travis and Lee counties on the north, Lee and Fayette counties on the east, Fayette and Caldwell counties on the south, and Caldwell and Travis counties on the west.

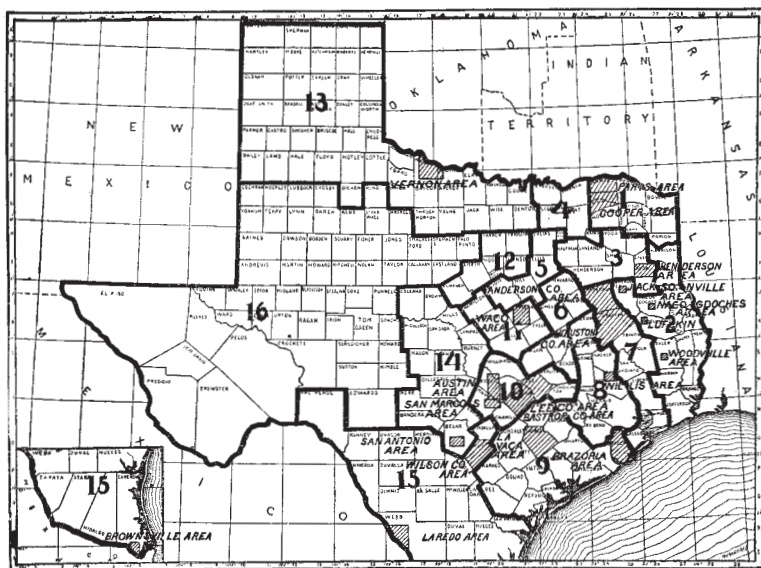


FIG. 21.—Sketch map showing location of the Bastrop County area, Texas.

In shape it is roughly a parallelogram, with its longest dimension from north to south.

The county was created March 17, 1836, and named for Baron de Bastrop. In April, 1837, it was organized, with Bastrop as the county seat, which distinction that town still bears. It is the oldest town in the county and one of the oldest in the State.

^a Seventy-eight square miles of this was surveyed in the San Marcos and Austin surveys, but is included in the present map to complete the county.

Bastrop County is an agricultural community, having, however, a few industrial enterprises in coal mining, brick making, pottery, and lumber. Glenham and Phelan, on the Missouri, Kansas and Texas Railway, between Bastrop and Elgin, are coal-mine stations. From both of these mines a good grade of lignite is obtained. The seams vary in thickness from 3 to 8 feet and appear at from 60 to 125 feet below the surface. The average daily output of both mines is about 250 tons, carrying a value of from \$1 to \$2 a ton. Brick making is very successfully promoted at and around Elgin, where excellent grades of brick clay and fire clay are to be had in abundance. A pottery plant is operated at McDade, in the northern section of the county, where a good grade material is turned out from the native surrounding clays. Lumber is cut extensively over the sand hills and gravelly ridges in the central section of the county, with Bastrop and Smithville as distributing points. There is a comprehensive and efficient system of telephone connections throughout the county, and telegraph offices are at all railroad points.

The topography of the county is rolling to comparatively level, and the elevation is from 375 to 600 feet above sea level. The general slope is to the east and to the Colorado River, which flows through the center of the county in a southeasterly direction. The gently rolling prairies in the northwest give way to the more rolling, sandy, timbered lands of the Susquehanna fine sandy loam to the east, near Elgin. This rolling area extends as far east as McDade, where it reaches the sandy divide of Norfolk fine sand, running in a southerly direction to the Colorado River and in a northward direction out of the county. In this northern section it constitutes a divide between the Brazos and Colorado rivers. The country to the west of this divide, including the northwest section of the county, is drained by Wilbarger, Big Sandy, and Piney creeks and their tributaries, all flowing in a southerly direction to the Colorado River. To the east of this divide and north of Paige, the slope is toward the Brazos River, while the eastern area south of Paige is drained by Gravelly and Pin Oak creeks and their tributaries, which also flow southward to the Colorado River. In the southern part of the county, a few miles west of Rosanky, occur broad areas of Norfolk fine sand, also constituting a divide, which is in line with that north of the river. The west and southwest quarter of the county, included between this divide and the river, is drained in an easterly direction by Walnut Creek and tributaries. These tributaries comprise Cedar and Alum creeks from the north and Elm, Sandy, and Piney creeks from the south. The slope of the extreme southern part of the county is to the south and southeast, with drainage through Borden, Prickly Pear, Grady, and Willow creeks, all emptying into the Colorado River.

The greater part of the county's population is of comparatively recent citizenship, and includes Americans, Germans, Swedes, Bohemians, Mexicans, and negroes. The first settlement was made about 1832, and the early population was practically all native-born Americans coming to the frontier from Missouri, Kentucky, Tennessee, Mississippi, Alabama, and the other old southern States. The rich natural resources of forest and soil offered inviting fields for the home seeker, and during the early settlement and later development, immigration took place both from the several States of the Union and from foreign lands, thus giving the county, within its seventy-five years of existence, a cosmopolitan population. A few Germans, English, and Irish were among the early settlers, coming direct from their native lands. The negroes came in large numbers after the close of the civil war, which time also marks the beginning of the influx of Mexicans, who have continued to come up to the present time.

A great majority of the Mexican population is composed of "peons," who, having escaped bondage, crossed the border into Texas. The various other nationalities living in the area have immigrated in part from the larger centers of the United States and in part from their native homes. Of the naturalized citizens, the Germans exceed in point of numbers and length of citizenship, and they can be found actively engaged in all lines of endeavor. The Bohemians and the Swedes are both industrious classes of people and much of the fertile farming land of the county is owned by them. The black prairies in the northwestern section of the county are owned largely by Swedes, their holdings extending almost to Austin. The southern section of the county around Rosanky is settled principally by Bohemians. Red Rock and Paige are German settlements. The negro and the Mexican population are well scattered throughout the entire area.

The county as a whole is fairly well populated, though the conveniences and benefits arising from railroad facilities and the productiveness of the soil determine largely the intensity of development. The stronger soils offer the greater reward for labor, and in consequence the Colorado River bottoms and the black prairie belt are the districts most thickly settled. The sandy hills, which extend in a southerly direction from the "Yegua Knobs" in the northern part of the county, ending in extensive areas of very gravelly hills in the central section, embrace a portion of the area that is extremely thinly settled. These gravelly areas can not be cultivated and the sand hills are unfitted for general farming. The present value of these hills is in the timber growth. The unimproved condition of the public roads is a strong factor in retarding a more general intensive development in the sections which are more distant from market centers. The county possesses an abundance of road material, however, and in time this will be utilized in improving roadways.

There are two systems of railroad crossing the county. Bastrop, the county seat, on the Missouri, Kansas and Texas Railway, with a population of 2,500, is located in the central section of the county, on the Colorado River. Smithville, in the southeastern section, with a population of 3,000, is also situated on the Colorado River. It is the junction point of the Missouri, Kansas and Texas Railway with a branch line extending to San Antonio and passing through Rosanky and Red Rock, two small towns in the southern and southwestern parts of the county, respectively. Elgin, in the north, has a population of 2,500, and here the Missouri, Kansas and Texas Railway and the Houston and Texas Central Railroad cross each other, the former running north and south and the latter east and west and passing through McDade and Paige, two small towns, with populations of 400 and 300, respectively, in the northeastern section of the county.

The Colorado River is bridged with steel structures at Bastrop and at Smithville. Several good fords and two ferries at convenient intervals afford ample accommodations for all travel, the river being fordable most of the year.

The agricultural interests of the county, as well as the commercial and industrial, are enjoying a substantial prosperity. The cotton losses sustained during the activity of the boll weevil resulted in the introduction of some new crops, with beneficial results. During the last two seasons the cotton crop has been little affected by the boll weevil and yields have been very profitable.

CLIMATE.

The latitude of Bastrop County is that of southern Louisiana and northern Florida, parallel 30° N. crossing near the center of the county. The climate is practically that of New Orleans, with less humidity, insuring healthful and pleasant climatic conditions.

The mean annual rainfall is 32.92 inches and the average annual temperature 67.4° F. January and February, the coldest months of the year, average approximately 49° F., with July and August, the warmest months, averaging about 83.5°. During the winter months very sudden changes in the weather occur, often giving a rapid fall in temperature of many degrees. These cold spells are known as "northers," on account of the direction from which they come and the accompanying cold winds. They are of short duration, however, and the temperature seldom falls to freezing point. However, occasional freezes occur of sufficient severity to prevent plowing, though cultivation can generally be carried on all the year round. Late frosts catch the fruit blossoms and early vegetables every few years, but a total failure of these crops has never resulted from this cause.

The following table, compiled from statistics of the Weather Bureau, shows the normal monthly and annual temperature and rainfall,

based on records covering a period of five years, from 1902 to 1906, inclusive. These records were kept at Taylor, Luling, and Austin, in Williamson, Caldwell, and Travis counties, respectively. There are at present no stations in Bastrop County. Taylor is a few miles north, Austin 15 miles west, and Luling 15 miles south of the Bastrop County area.

Normal monthly and annual temperature and precipitation.

Month.	Taylor.		Luling.		Austin.	
	Temperature.	Precipitation.	Temperature.	Precipitation.	Temperature.	Precipitation.
	° F.	Inches.	° F.	Inches.	° F.	Inches.
January.....	47.7	0.83	49.2	1.16	49.4	0.85
February.....	48.6	2.53	50.7	3.33	50.8	3.26
March.....	60.5	2.38	62.2	1.64	62.1	2.41
April.....	67.4	3.18	68.7	3.11	68.8	3.88
May.....	74.3	3.51	75.1	2.94	76	3.99
June.....	79.8	3.18	80.8	2.50	82.3	2.53
July.....	80.6	7.22	82.2	5.01	83.2	5.08
August.....	82.1	1.35	83.5	1.30	84.1	1.59
September.....	77.7	2.79	79.1	3.42	79.5	2.51
October.....	67.2	2.43	68.5	2.98	68.3	2.06
November.....	59.7	2.37	60.9	2.12	60.9	2.14
December.....	50.5	1.88	51.9	2.76	52.1	2.55
Year.....	66.3	33.65	67.7	32.27	68.2	32.85

The rainfall is fairly well distributed throughout the year and would, if properly conserved, accommodate the growing crops during any summer drought.

The following table, compiled as the preceding one, gives the dates of the first and the last killing frosts for the years 1902 to 1906, inclusive, and also the average dates for that entire period.

Dates of first and last killing frosts.

Year.	Taylor.		Luling.		Austin.	
	Last in spring.	First in fall.	Last in spring.	First in fall.	Last in spring.	First in fall.
1902.....	Mar. 6	Dec. 4	Mar. 6	Nov. 27	Mar. 6	Dec. 3
1903.....	Mar. 1	Nov. 17	Mar. 2	Nov. 18	Feb. 18	Nov. 18
1904.....	Mar. 4	Nov. 12	Mar. 4	Nov. 12	Mar. 4	Oct. 12
1905.....	Feb. 21	Dec. 3	Feb. 22	Dec. 4	Feb. 21	Dec. 4
1906.....	Mar. 20	Nov. 21	Mar. 20	Nov. 20	Mar. 20	Nov. 20
Average.....	Mar. 5	Nov. 23	Mar. 5	Nov. 22	Mar. 2	Nov. 17

AGRICULTURE.

The earliest settlers of the county made their homes in and around the site on which Bastrop now stands, where they found a very primitive agriculture carried on by Indians and Mexicans, the crops consisting of small patches of corn and vegetables. The food supply was

obtained principally from the forests and streams, which abounded in game and fish. The three earliest settlements were at Bastrop in 1832, at Cedar Creek about the same time, and at Perryville, better known as "Hog Eye," in 1838. Many of these settlers received a league of land each from the Government, of which they devoted small areas along the easily cultivated river bottoms to corn, wheat, rye, and vegetables, holding the greater stretches as pasturage for their stock. The establishment of homes by those who came to the frontier resulted gradually in a more sturdy agriculture, though the raising of cattle was the principal industry, and so continued for a long time. The valley lands along the river and the creeks were the first to be cultivated, as the homes of the settlers were placed in those localities where a supply of water was convenient. Ease of cultivation and a natural fertility were essentials for all cultivated areas. The growing of cotton, which in later years became the chief product of the county, was introduced soon after settlements were made, though its cultivation was very limited for many years. The first cotton crops of any extent were grown in the late forties and by men who owned slaves. Horsepower gins were used and the raw product was hauled overland by ox teams to the nearest markets—Houston and Port Lavaca, and later to Austin. In return for cotton the ox teams brought back provisions and other necessities. The lack of railroad facilities prevented any very extensive operations in cotton, though Austin became a close market and gave an impetus to an increased production of that crop. Corn and the other general farm crops kept pace with the agricultural development.

In 1869-70 the Houston and Texas Central Railroad, with its terminal at Brenham, the nearest railroad point to Bastrop, extended its line to Austin, passing through the northern section of the county from east to west and crossing the old San Antonio trail at Paige. This afforded a more ready means of marketing products and marks an era in the agricultural as well as the commercial life of the county. In 1887, the Missouri, Kansas and Texas Railway passed through the county from north to south, crossing the Houston and Texas Central Railroad at Elgin, and opening up the central and southern sections. These convenient transportation facilities resulted in greater agricultural development, which was also stimulated by increasing demands. The stock and cattle ranges gradually gave way to cultivated areas of cotton, corn, and other staple crops, thus making the county decidedly an agricultural community. Stock raising has been carried on continuously, even during recent years, though in limited ways.

The present agriculture consists in the raising of cotton as the chief money crop, with corn, wheat, oats, sorghum, melons, potatoes, various vegetables, fruits, berries, peanuts, some cowpeas, alfalfa, Johnson grass, millet, etc., in sufficient quantities to meet local demands. No

general system of growing crops in beneficial rotation has ever been adopted in the agriculture of the county, and little or no fertilizer has ever been used. The fertile alluvial soils of the stream bottoms and the productive black prairie clays, constituting the strongest soils of the area for general farming, have as yet suffered little if any deterioration on account of the one-crop system, but the lighter sandy soils of the rolling uplands are soon reduced to a low productiveness by the inconsiderate and continual cropping of cotton and corn. These lighter soils are better adapted to a variety of crops, such as fruits, truck, and probably tobacco, than they are to general farming. They give fairly good yields of cotton and corn, however, for two or three years. For these soils is recommended the addition of green manures. Systematic crop rotation, which includes a broadcast growth of cowpeas every two or three years to be plowed under after the fruit has been harvested by hogs or in other remunerative ways, would no doubt greatly increase the crop yields. The failure to care for and improve the cultivated areas of these light soils has been due to the abundance of cheap new lands which were naturally fertile and which could be more or less easily cleared for cultivation. It has resulted in the abandonment of areas after a few years' tillage. The improvement of these lands by means of proper cultural methods was sacrificed in the effort to obtain yields at the least expense. Probably such a practice was once sanctioned by economic conditions, but these soils now represent agricultural possibilities that merit the attention of progressive farmers in supplying the diversified demands of a growing country.

Cultivation is carried on practically along the same lines as it was years ago, except by some of the most progressive farmers, who have introduced modern farm machinery and other general improvements. Crops are still planted and matured with as little expense as possible. The preparation of the land for cotton and corn begins in January and February. The soil is broken 3 or 4 inches deep and left in ridges until the planting season, which is in late March. This treatment of land can not be upheld, as it allows free evaporation of the soil moisture for too long a time in a section where summer droughts sometimes seriously damage the crops. While it is true that the annual rainfall is sufficient to mature all crops when distributed through the growing season, a proper regard for the conservation of the late spring rains would guard against possible loss in unfavorable seasons. Deeper cultivation in preparing the soil, to render it retentive of moisture, and frequent shallow tillage during the growing season, especially following rains, to destroy capillarity by the formation of a dust mulch, would be of much benefit in overcoming the injurious dry seasons. The machinery used in planting, in passing over the ridges or beds, has a tendency to break them down considerably, leaving the seed about on an average ground level. Some

areas in the flat, poorly drained regions are best handled by ridge culture, but the tendency generally is for flat cultivation.

The most of the hired labor in the county is supplied by Mexicans and negroes, of whom many are found in all parts of the county. They are engaged by the month or by the year at an average wage of \$18 to \$20 a month. This supply of farm labor is usually sufficient to meet all demands, except during the rush of the cotton-chopping and cotton-picking seasons, when additional day labor is necessary. In such instances laborers are paid from 75 cents to \$1.25 a day, and the demand is often in excess of the supply. Occasionally this day labor is paid by piecework, which on an average amounts to about \$1 a day. Cotton choppers may receive so much per acre for their work and cotton pickers so much per hundred pounds of cotton picked, the price being generally about 75 cents an acre for choppers and from 50 to 75 cents a hundred pounds for picking. The apparently more attractive life of the industrial and commercial centers is drawing much of the labor from the farms, though as yet the labor question has not reached serious proportions.

The cultivation of the land is carried on in part by the landowner and in part by the tenant or renter through a system of limited tenure of the land and a division of crops according to the expenses incurred by the owner and by the tenant. When the owner furnishes the land, all work stock, the seed, and the house for tenant, he receives one-half of all crops; when he furnishes only land and house for tenant he receives one-fourth of the cotton and one-third of the grain crops. These are the popular terms on the share basis. Land is also rented on a cash basis, the tenant paying from \$3 to \$4 an acre, according to the productiveness of the land. The cash system is very popular and is, no doubt, the most advantageous. Cotton being the money crop, all landowners leasing land on a share basis insist on dictating the extent of that crop, with the result that the tenant is limited more or less in the matter of crop diversification. By the cash system he is free to grow such crops as he deems most profitable.

The census of 1900 gives the average size of farms in the county as 110.9 acres, with 37.6 per cent of these farms operated by the owners. The stronger soils, comprising the river bottoms and the black prairie clays, show a smaller acreage per farm than the less valuable sandy lands. Agriculture on the stronger soils and in the immediate vicinity of commercial centers is more intensive than in other sections of the county and land values are correspondingly high.

The following general suggestions would conduce to a stronger agriculture in the county; careful tillage methods looking to the conservation of soil moisture, a beneficial system of crop rotation, a study of adaptability of crops to special soils, and systems of permanent

soil improvement. The gradual growth of the larger trade centers, the ready marketing facilities, the advent of the destructive cotton boll weevil, and the introduction of new lines of remunerative agriculture are all combining to bring about a recognition of the wisdom of such changes.

SOILS.

Bastrop County presents an area with a diversity of soil types and of conditions sufficient to meet the demands of a most diversified agriculture. The alluvial soils or fertile bottoms along the Colorado River, which flows across the central part of the county in a southeasterly direction, consist of clays, silts, and sandy loams, while the uplands present types ranging from the productive heavy black clays of the gently rolling prairies to the loose and incoherent sands of the more rolling or hilly country. While it is true that many of the lighter soils of the area show a low agricultural value after their virgin productiveness is reduced by careless methods of cropping, these are by no means "waste soils," for the introduction of proper cultivative methods, together with some systematic rotation of crops insuring a necessary and continuous supply of organic matter, and the selection of crops suited to soils of this texture will bring them into much account as an asset in the agricultural resources of the county.

Twenty-three types of soils were established in the county, occurring as derivatives from the underlying geological formations, through the agencies of erosion, or as the result of the intermingling of the disintegrated material of different formations, or as alluvial material deposited by the river waters during periods of overflow, or as any of the above materials more recently influenced by modifying agencies, such as local conditions of rainfall, drainage, aeration, oxidation, erosion, etc.

The following table gives the names and areas of the several soil types shown on the accompanying map:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Susquehanna fine sandy loam.....	195,456	33.3	Lufkin gravelly loam.....	10,752	1.8
Norfolk fine sand.....	94,784	16.2	Bastrop sandy loam.....	7,680	1.3
Susquehanna gravel.....	50,880	8.7	Bastrop silt loam.....	6,080	1.0
Lufkin fine sandy loam.....	35,136	6.0	Lufkin sandy loam.....	5,312	.9
Houston loam.....	33,792	5.8	Lufkin fine sand.....	3,072	.5
Bastrop fine sandy loam.....	26,496	4.5	Wabash clay.....	2,432	.4
Houston gravelly clay.....	25,920	4.4	Wilson loam.....	1,664	.3
Wilson clay loam.....	17,536	3.0	Crockett loam.....	640	.1
Orangeburg fine sandy loam.....	17,216	2.9	Crockett clay loam.....	512	.1
Houston black clay.....	16,128	2.7	Swamp.....	320	.1
Bastrop clay.....	12,352	2.1			
Orangeburg fine sand.....	11,904	2.0	Total.....	586,944
Meadow.....	10,880	1.9			

Three distinct geological formations appear in the county, causing the broad separation of the soils into three general groups, the areas in each group following the general trend of the underlying formation in a north and south direction. These series are affected by many modifying influences, which give rise to various subdivisions or individual types of soil. Along the northwestern border of the area, adjoining Travis County and extending almost to the Colorado River, is a narrow strip of black prairie clay representing the eastern boundary, in this section, of the stiff black clays found extensively in Travis County and derived from a series of unstratified calcareous clays and clay marls of Upper Cretaceous time, known as the Taylor marl formation. The weathering of this formation, which is often several hundred feet deep, gives rise to the type of soil known as the stiff heavy black prairie clay and classified as the Houston black clay. The Taylor marl formation extends across Travis County in a southerly direction and occurs extensively in Hays and Caldwell counties, as shown in the San Marcos sheet of the Soil Survey. In the southwestern part of Bastrop County and extending from Caldwell County is an arm of this calcareous material, giving several square miles of Houston black clay in that locality. In the neighborhood of Paige, in the northeast section, is found the western edge of what is known as the San Antonio prairie, where several square miles of the Wilson clay loam is mapped. On the crests and slopes of some of the highest ridges of the rolling prairie uplands, this calcareous material has been modified by the remains of old gravel deposits, probably the Uvalde of Neocene time, thereby giving rise to the type—Houston gravelly clay. The most extensive areas of this gravelly type are found in the western edge of the county, occurring on the higher ridges a few miles north of the Colorado River. A few small areas are found around Paige. To the east of this black prairie formation is the rolling, sandy, timbered belt. At the juncture of the black prairie clays and the light sandy soils is a rather broad gradation zone showing a soil resulting from the intermingling of material from the two formations, which soil is classified as the Houston loam. Extensive areas are found around Red Rock, and many small isolated areas of a calcareous material are found which have been so modified by the surrounding sandy types that they belong to the loam member of the Houston series. The Houston series is a very productive group of soils, and while careful cultivation is necessary to secure good tilth, these soils are considered the most desirable and strongest of the upland types for general farming.

In point of extent the predominating type of soil in the county is the Susquehanna fine sandy loam, occurring to the east of the Taylor marl formation. This type extends across the area from north to south in a broad belt, being intersected by the Colorado River bottoms near the center of the county and broken by large and small

areas of other types. The geological formation underlying this type is of Eocene Tertiary time and consists of sands, sandstones, and stiff clays. The weathering of this material results in giving the heavy red to reddish-brown and mottled clays underlying the sandy loam surface soil of the type.

Probably the Lignitic stage of Eocene time furnishes a part of the material constituting the Susquehanna fine sandy loam. Lignitic seams are found in the north-central part of the county, with outcrops of lignitic material along the Colorado River a few miles above Bastrop. This material being at some depth below the surface, however, is probably overlain by marine beds of later time. The surface material over the extent of the type is, in general, the same. Ferruginous masses and fragments of sandstone are common on the higher ridges, as are also waterworn gravels and pebbles. Modifying agencies of erosion, aeration, and oxidation have affected local detail characteristics of color, structure, and depth of this soil. Adjoining the more recent formation of Eocene time to the east, the Susquehanna fine sandy loam is very perceptibly influenced by the materials of that formation, especially by the gray mottled clays. There is less of the uniform red and more of the grayish red mottling in this position. The formation underlying this type broadens out in the southern part of the county, reaching as far west as the southeastern part of Travis County and extending southward across the eastern edge of the San Marcos area. Throughout this extent it gives rise to the Susquehanna fine sandy loam. This type of soil is easily worked and is adapted to a diversity of crops, a careful system of crop rotation being necessary, however, to secure sustained productiveness.

In the northern part of the county the Susquehanna fine sandy loam gives way to the sandier type, the Orangeburg fine sandy loam. There is mapped of this soil about 27 square miles. It is derived from the disintegration of sandy clay beds of the Claiborne stage of Eocene time. The type, in passing into Lee County, develops extensively, affording throughout its occurrence a very desirable and profitable soil for diverse agricultural practices.

In the northern half of the county and immediately to the east of the Susquehanna fine sandy loam and the Orangeburg fine sandy loam, beginning at the "Yegua Knobs" on the Lee County line and extending in a west-of-south direction to the gravelly hills adjacent to the Colorado River near Red Bluffs, is a series of sandy hills constituting a broad divide, which, no doubt, represents the beach of an ancient shore line. The occurrence of this deep sand gives rise to the type mapped as Norfolk fine sand. Probably a part of this type, occurring on some of the higher hills which are composed of a ferruginous sandstone, has been derived from the disintegration of that formation, the finer material having been washed out. Areas of

this material showing a surface soil of sand more than 20 inches and less than 3 feet deep, and underlain by a reddish sandy clay, were mapped as Orangeburg fine sand. The origin and texture of the two types is the same, the distinction being a question of depth of surface soil.

To the east of this sandy divide, and running generally southward, occurs a series of sands, fine sandstones, gravels, and grayish to dark grayish mottled clays. This formation belongs to the Jackson stage of Eocene Tertiary, and weathers into mottled yellow and gray impervious sandy clays which characterize the Lufkin series of soils. The general topography of this formation is more gentle than of the older formation to the west. On the most rolling areas are found the remains of old gravel deposits, which give the Lufkin gravelly loam type. Local conditions of better aeration and oxidation over the gravelly loam extent result in giving the subsoil a predominating reddish color, erosion often exposing this clay. On the more gently rolling to level areas is found the Lufkin fine sandy loam, while the lowest areas or depressions may give the Wilson loam.

It is in the northern section of this formation around Paige that the brownish-black clays or clay loams of the San Antonio prairie occur. This is not the typical black prairie soil, as it has been greatly influenced by the surrounding formation. There are areas of the Lufkin soils scattered through it, and it is between a body of this brownish-black clay loam and the Lufkin fine sandy loam that is found the only extensive area of Wilson loam. The formation of these sands, sandstones, and mottled clays extend into Fayette County and into the southern half of Lee County, where they give rise to extensive areas of the Lufkin soils.

The bottom lands of the Colorado River comprise a wide extent of valuable soils, all of which are derived from an old alluvial deposit. They occupy broad and level to gently rolling stretches, occurring as a series of terraces. The river valley is from 1 to 4 miles wide and is flanked on each side generally by a series of gravelly hills or ridges. Many places show a steep escarpment reaching to the river, with the broad bottoms on the opposite side, such a condition resulting from the meanderings of the river course. The gravelly hills skirting the bottom lands show much evidence of river action. Rounded, waterworn gravel, pebbles, and flint cobbles, intimately mixed with the soil or cemented together with reddish to brownish clays, or gravelly beds resting on stratified material, show that these areas have been subject to water action. In the river bottom proper the highest terraces or swells represent the oldest river deposits. The red sandy clay material underlying the sandy loam surface soil no doubt represents material of the old Permian red beds reworked by the river, and the occurrence of this material gives rise to the Bastrop

sandy loam, the lightest general farm soil of the bottom types. The more level areas, with more fine material, a darker color, a heavier subsoil, and a closer proximity to the river, represent a later deposit. These have been mapped as the Bastrop fine sandy loam, which is probably the best of the alluvial soils. The Bastrop silt loam consists of a still heavier material and represents a deposition in areas of slowly moving overflow waters. The heaviest bottom-land type is the Bastrop clay, found generally in gentle depressions or hollows. It is no doubt eroded material of the black prairie regions, and constitutes the heaviest and strongest of the alluvial soils. Along the banks of the river occur at intervals strips of varying extent of deep sand or loamy sand, representing the natural levees and mapped as Meadow. Some of the smaller streams have also very narrow strips of this transported material, though the stream channels are generally sufficiently deep to carry all the rainfall without overflow.

The extensive areas of gravelly hills and ridges flanking the river valley contain too large a percentage of gravel, pebbles, and cobbles to have any agricultural value, the timber growth of pine and hardwood being the chief asset. These areas are mapped as Susquehanna gravel.

There exist several other, but unimportant, types of small extent, the result of conditions arising from influences which locally affect the character of the general material.

WILSON CLAY LOAM.

The soil of the Wilson clay loam has a depth of 6 to 10 inches and varies from a dark-brown to black clay loam or clay. It becomes very sticky when wet and contains varying amounts of gravel and pebbles. During dry weather it cracks badly, many of the crevices being from 3 to 4 inches wide.

The subsoil is a heavy clay to a depth of 36 inches and contains varying amounts of lime. It is usually of a dull dark-yellowish color and sometimes is streaked with black.

The type is located in two irregularly shaped areas, one in the northeastern part of the county in the vicinity of Paige, and the other in the southwestern part around Red Rock. It is locally known as "mesquite prairie." The surface of the type is so gently rolling as to allow ready cultivation. During very heavy rains it often happens that the greater part of the water sinks into the cracks formed during dry weather, only a comparatively small amount of water passing off through surface drainage channels. Areas needing artificial drainage, however, are not often found.

Wilson clay loam is a strong soil and has been under cultivation for several years. The principal crops grown upon it are cotton, corn, and oats. Both cotton and corn withstand long periods of

drought, since a large amount of moisture is stored up in the subsoil. Corn yields from 30 to 50 bushels and cotton from one-half bale to 1 bale to the acre. It is very probable that alfalfa would do well on this soil. A considerable part of the type is now used for pasture and meadow. Deep plowing is to be recommended.

The following table shows the texture of the soil and subsoil of the Wilson clay loam:

Mechanical analyses of Wilson clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
16671.....	Soil.....	0.4	0.9	0.5	8.0	10.9	44.4	34.1
16672.....	Subsoil.....	1.1	1.6	.5	6.1	7.8	45.1	36.8

HOUSTON BLACK CLAY.

The soil of the Houston black clay, to a depth of from 8 to 14 inches, is a black to drab colored clay, containing some lime concretions and a high percentage of organic matter. The subsoil, to a depth of 36 inches or more, is a stiff, tenacious, brown to grayish-black clay, lighter in color than the surface soil and possessing a waxy feel. It contains a larger percentage of lime concretions than the overlying material and as the depth increases the clay becomes stiffer in structure and lighter in color.

This type is known as the "black lands" and constitutes the rich black prairie soil of the area. Being a heavy clay it is less easily handled than the lighter textured types, and much care is necessary to secure proper tilth. A careful cultivation for several years renders it a loose and friable soil, which becomes, however, very sticky when wet. If plowed too soon after a rain or when too wet, the soil breaks into clods which bake very hard on drying and which are broken only with difficulty. Unless continually cultivated, the surface bakes and cracks irregularly into blocks, the condition generally seen along the roadways. These cracks are often several inches wide and 2 to 3 feet deep, and during the winter season they afford a ready channel for the rainfall into the underlying subsoil, where the water is stored to be used by the crops during the dry summer months. The soil has good surface features, great natural productiveness, and is adapted to a wide range of crops, and when properly handled it responds as the strongest soil of the county.

The Houston black clay is found typically developed along the northwestern edge of the county and extends almost to the Colorado River. This narrow strip, covering 15 or 20 square miles, represents the eastern edge of the extensive black prairies immediately to the west.

The topography of the Houston black clay is gently rolling to rolling where it adjoins the more hilly country of the other types, and the natural drainage of the areas is good, with none of the bad effects of erosion. The undulating areas present rather wide valleys with an easy incline to the broad and rounded hills or swells. The stream courses, which are generally dry in summer, except during the rainy seasons, show no distinctly cut channels, as is seen in the other types of the area; still they afford ample outlet for excessive rainfall. The average elevation of this type is about 500 feet above sea level.

This stiff, heavy black prairie soil is derived in situ from the disintegration and weathering of calcareous clay and marl deposits, known as the Taylor marl formation, belonging to Upper Cretaceous time. The original material has a light-brown color, but weathers into a very productive black clay. On the more rolling areas or where the soil adjoins some of the gravelly types, it has been influenced by the intermingling of a small percentage of rounded gravel.

Scattered throughout the extent of this type are often found small areas, seldom exceeding an acre or two in size, that are locally known as "gall spots," because of the fact that cotton will not grow thereon. On these spots corn does not show any distress. The presence of alkali is still largely accepted as the cause of these local conditions, but investigation shows the trouble to be caused by a fungus attacking cotton, alfalfa, and other deep-rooted plants. The work of the Bureau of Plant Industry has demonstrated that deep plowing and frequent cultivation and the use of barnyard manure or green manure lets air into the soil and enables the crops to resist the disease. Grasses, grains, and corn are not affected.

The Houston black clay is adapted to general farming and ordinarily produces large yields. Cotton, corn, sorghum, and oats are the more extensively grown crops, while potatoes and garden truck are very successfully produced for local consumption. Cotton will average from one-half to three-fourths of a bale per acre, corn from 30 to 40 bushels, sorghum from 3 to 4 tons, and oats from 30 to 40 bushels. The last-named crop, however, is generally cut and fed to the stock in the straw. Better cultivation will, under favorable conditions, show much larger yields; cotton producing a bale to the acre, and corn from 40 to 60 bushels when not affected by drought. The type generally is very retentive of moisture and enough of the spring rainfall is stored in the subsoil to mature good yields despite the dry seasons. If properly seeded, alfalfa could probably be grown very successfully. The natural growth of this black clay is mesquite and prickly pear. It also supports a growth of native grass that makes excellent pasturage. The value of this land ranges from \$25 to \$75 an acre, according to local conditions.

The following table gives the results of mechanical analyses of both soil and the subsoil of this type:

Mechanical analyses of Houston black clay.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
16669.....	Soil.....	0.1	0.6	0.8	16.9	12.0	40.0	28.8
16670.....	Subsoil.....	.6	1.0	1.2	11.3	6.7	46.9	32.0

The following sample contained more than one-half of 1 per cent of calcium carbonate (CaCO_3): No. 16670, 1.7 per cent.

HOUSTON GRAVELLY CLAY.

The Houston gravelly clay, to a depth of 12 inches, is a heavy dark-brown to black clay loam to clay, carrying a large quantity of rounded, waterworn gravel, varying in size from one-eighth to 3 inches in diameter, both in the soil and on the surface.

The subsoil, from 12 to 36 inches, is a stiff, compact yellowish-brown to grayish-black clay containing a small percentage of gravel. The gravel content of both soil and subsoil varies with the locality, the largest percentage being found on the crests of the ridges. Along the slopes and on the more or less rolling areas cultivation is comparatively easy, though the general roughness of the country and the presence of stones prohibit the free use of farm machinery.

The largest area of the Houston gravelly clay, comprising a few square miles, is found near the western edge of the county just to the north of the Colorado River, where it occupies the highest ridges of the black prairie area. The rolling black prairie lands to the north end in these higher ridges in the neighborhood of the river, where the remnants of old gravel formations give rise to the gravelly type. Several small areas are found south of the river and in the vicinity of Paige, in the eastern part of the county.

The topography of this type is rolling to very rolling, and this, together with the gravelly nature of the soil, insures ready drainage. The stiff clay subsoil, however, being very retentive of moisture, preserves enough of the rainfall for the maturing of crops during the summer season, droughts being no more severe than on the more level types.

The Houston gravelly clay represents areas where active erosion has been going on. The black prairie soil which overlaid the gravel formations, probably the Uvalde of Neocene time, was washed away sufficiently to expose these gravel beds, which in time were also worn away, leaving, however, a thin mantle resting on the underlying clays. These remnants of the old gravel beds have become mixed with the clayey material giving the present conditions. Much of the finer

material has been washed from the crests of the higher ridges to the hillsides or lower lying areas, leaving in these localities the most gravelly phase.

General farming is practiced, and when proper cultivation is carried on good yields are obtained. Cotton ordinarily produces from one-third to one-half bale per acre, and corn from 20 to 30 bushels. Some of the land, in the hands of careful farmers, will yield about three-fourths bale of cotton regularly, and from 25 to 40 bushels of corn per acre. A better yield of corn is had when a good rainfall is distributed throughout the growing season. Oats do well, producing from 25 to 40 bushels per acre, though this crop is generally fed in the straw. All the general garden vegetables are grown successfully for home use. The location of the type, its hilly topography, and its gravelly character render it less desirable than the rolling prairie.

The natural growth of the Houston gravelly clay is a forest of oak and cedar. The value of the land is from \$10 to \$30 an acre, according to local conditions.

The following table gives the results of mechanical analyses of the fine earth of both the soil and the subsoil:

Mechanical analyses of Houston gravelly clay.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
16151.....	Soil.....	4.2	3.5	1.8	7.6	8.8	45.0	23.5
16152.....	Subsoil.....	1.8	2.2	.9	3.2	6.4	47.2	37.6

HOUSTON LOAM.

The Houston loam is a brown to grayish-brown loam 8 to 12 inches deep, underlain to 36 inches by a brownish to drab-colored clay subsoil, carrying a high percentage of silt, and some fine sand, and occasionally some gravel. The surface soil varies from a light loam to a clay loam, according to topography and to proximity with the light sandy soils or the heavy clay soil. The color also varies from grayish to brownish; on the crests of gentle elevations it may show a light-brown color, while the depressions or more level areas may be a gray to dark gray. The surface loam generally carries a high percentage of silt, and some organic matter. The subsoil, at lower depths, is quite stiff and is often of a mottled appearance, being streaked with reddish brown. As shown in road cuts and washes, it may have a much lighter color. When properly cultivated it is a loose, friable soil and is more easily handled than the Houston black clay.

The Houston loam occurs in the northwest section of the county as a narrow strip occupying a position between the black prairie soils

and the rolling sandy uplands. In the southwest, in the neighborhood of Red Rock, are found rather extensive areas running in a general northeast and southwest direction. These areas are of irregular shapes and sizes, but they hold a position which clearly indicates the original existence of much calcareous material, probably an arm of the Taylor marl formation extending from the main body into this section. The influence of the surrounding sandy formations has broken the uniform extent of that material and given rise to the irregular areas of Houston loam. Many small areas are found scattered throughout the county.

The topography of the type is gently rolling to rolling and the natural drainage is good, except in occasionally depressed areas where the condition can be more or less easily remedied by ditching.

The Houston loam, occurring as it does on the more rolling upland prairies between the heavy black clays of the Taylor formation of the Cretaceous period and the sandy, timbered soils derived from sands, sandstones, and clays of Eocene time, is a gradation type and represents the intermingling of the materials of these two classes of soils.

Much of the type is under cultivation and constitutes desirable land for general farming. The summer droughts occasionally injure the late-maturing crops, though good yields of cotton, corn, oats, and sorghum are produced. Potatoes and vegetables do well, though they are not extensively grown. Cotton will average about one-half bale per acre; corn from 15 to 30 bushels; oats from 15 to 30 bushels, and sorghum about 2 tons. Thorough and careful tillage, with a system of rotation of crops, would substantially increase the productiveness of this soil.

The approximate extent of the Houston loam is about 53 square miles. It has a value of from \$15 to \$35 an acre according to local conditions.

The following table gives the results of mechanical analyses of samples of both soil and subsoil of this type:

Mechanical analyses of Houston loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
16149.....	Soil.....	0.2	2.2	2.1	10.3	18.5	55.4	11.3
16150.....	Subsoil.....	.6	2.6	1.6	8.1	16.5	40.9	30.2

SUSQUEHANNA FINE SANDY LOAM.

The surface soil of the Susquehanna fine sandy loam, which has a depth of from 8 to 16 inches, consists of a gray to reddish-brown fine sandy loam, containing generally a percentage of iron concretions and, where the type occupies the crests or slopes of hills, some

small gravel. In this position fragments of ferruginous masses are also common. The subsoil, to a depth of 36 inches or more, is a heavy red to reddish-brown clay and generally mottled at lower depths. The sand content of the soil varies in texture from medium to fine. The subsoil shows the mottled appearance at about 24 inches, though the heavy red clay may extend to 36 inches or more. There is no regularity in this color appearance of the subsoil, though generally the more uniform red color is found on the slopes or where better aeration and oxidation is possible.

The line of separation between the soil and the subsoil is quite distinct, and while the overlying sandy material may impart a low sand content to the immediately underlying subsoil, it quickly passes into the heavy clay. The loose, open structure of the soil, its rolling topography and good drainage render it easy of cultivation.

The Susquehanna fine sandy loam is the predominating soil type of the uplands and embraces approximately 305 square miles. It extends in broad limits across the center of the county in a northeast and southwest direction, being broken, however, by areas of other types and crossed by the broad bottom lands of the Colorado River near the center of the county.

The topography is rolling to hilly, affording good natural drainage. Much of the soil is subject to erosion, especially the more hilly sections, where is found also a lighter soil. The lower lying areas possess a larger percentage of the finer grades of material, this material having been washed down from the surrounding elevations. Erosion is sometimes quite severe on the hillsides, often washing away the sandy surface soil and exposing the subsoil.

Both the large and small streams, which are generally dry in summer, have cut rather deep channels through the underlying clays and washes may be frequently seen from 6 to 12 feet deep extending down the slopes.

The approximate elevation of this type is 500 feet above sea level over its entire occurrence. The rolling areas of the Susquehanna fine sandy loam are not very retentive of moisture and crops often suffer during the summer droughts, while the lower lying areas may not be so badly affected, as they receive and retain more of the rainfall and the drainage water from the higher lands. These summer droughts offer the chief difficulty in diversifying the crops to which this type of soil seems adapted; still, a proper attention to the conservation of soil moisture would greatly simplify this problem.

The Susquehanna fine sandy loam is probably derived from the clays of the Claiborne stage of Eocene Tertiary time. Outcrops of fine-grained sandstone and ferruginous conglomerate are found capping many of the higher hills, while fragments of these materials are found extensively scattered over the surface.

General farming is practiced on the Susquehanna fine sandy loam, cotton, corn, and oats being staple crops, while potatoes, fruits, melons, vegetables, and peanuts are grown for local markets and home consumption. No fertilizers are used on this soil, no system of crop rotation is practiced, and little attention is given to improvements. The soil is naturally productive, but with continual cropping the yields decline and when the point is reached where little profit results, new lands are brought into cultivation. Cotton is more generally cultivated than corn, the latter crop being confined to the lower lying bottom lands, where the conditions are more favorable. The average yield of cotton is from one-fourth to one-third bale per acre; corn, from 15 to 25 bushels, and oats from 10 to 20 bushels, though these are generally fed in the straw. Peanuts produce abundantly and are grown for local consumption and as pasturage for hogs. With a system of crop rotation, furnishing some organic matter to the soil, the productiveness of the type would be greatly increased and indefinitely maintained. The rotation of cotton, corn, and cowpeas, with the peavines plowed under, is recommended. The type gives excellent yields of potatoes, vegetables, melons, grapes, and peaches. All small fruits adapted to the climatic conditions would do well.

The culture of tobacco could probably be promoted over at least certain areas of this type. Where the soil material at lower depths has more or less the character of the Orangeburg subsoil, which appears to possess certain characteristics essential to the production of a desirable type of tobacco, the cultivation of this crop is a practical agricultural problem. The soil occurs rather typically developed throughout the central and southern sections of the county and is not considered generally as being especially adapted to tobaccos of very desirable qualities.

In its original condition this land supports a growth of hardwood, chiefly post and black-jack oak, with some pine in the central part of the county. It has a value of from \$4 to \$10 an acre. The cultivated areas sell for from \$10 to \$20 an acre, according to local conditions.

The following table gives the average results of mechanical analyses of both soil and subsoil of this type:

Mechanical analyses of Susquehanna fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
16147, 16703.....	Soil.....	0.1	0.4	0.8	33.5	33.2	24.7	7.7
16148, 16704.....	Subsoil.....	.1	.3	.6	19.1	20.1	20.2	38.9

ORANGEBURG FINE SANDY LOAM.

The soil of the Orangeburg fine sandy loam, to a depth of from 6 to 15 inches, is a medium to fine grayish to reddish-brown loamy sand to sandy loam, containing some organic matter, many iron concretions, and often fragments of ferruginous sandstone. The subsoil, to a depth of 36 inches or more, is a red to orange-red sandy clay showing in many places a high clay content. Iron concretions also occur in the subsoil, which at lower depths rests upon horizontal beds of stratified clays. The more sandy areas, showing a surface soil from 20 to 30 inches deep, were mapped as Orangeburg fine sand. The loose, open structure of the soil and good natural drainage render it easy of cultivation, care being occasionally necessary to prevent erosion on some of the most rolling areas.

The type occupies, approximately, 10 square miles of country in the northern section of the county. Occasional small areas are found irregularly scattered throughout the adjoining types to the south. The topography is gently rolling to rolling and the drainage is good.

The Orangeburg fine sandy loam is derived from the disintegration and breaking down of beds of sandy clays of Eocene Tertiary time. It appears to be continuous with the formation giving rise to the Susquehanna fine sandy loam toward the south. The generally loose, sandy nature of the soil would indicate that much of the finer material has been transported from its original position. The hills and slopes show the sandiest phase of soil, while the areas adjoining stream courses generally present a more loamy texture, holding as they do much of the finer material that has been washed down from the higher elevations.

When first deforested and devoted to agriculture this soil produces good yields of ordinary farm crops. Continuous cultivation, however, without the application of any manures or the use of leguminous or other crops that could furnish at least organic matter to the soil, soon deprives it of its virgin productiveness. It is a soil not so very retentive of moisture, particularly on the ridges and slopes; still, a careful tillage and a system of crop rotation that would furnish organic matter in appreciable quantities would make it very well suited to the general farm crops. Especially is this true of the more level, lower-lying areas.

The type is naturally a loose, open, warm soil adapted to truck and fruits. Peaches do remarkably well, though they have never been grown on a commercial scale. Fruits, melons, potatoes, peanuts, and various vegetables could no doubt be grown very profitably.

This soil has been found to be well suited to the growing of tobacco in many sections of the country and could no doubt be used for this crop in this locality. The favorable climatic conditions might justify the extension of tobacco culture.

In connection with the material giving rise to the Orangeburg series of soils is a formation which weathers into the Susquehanna series, extensive areas of which occur throughout the central and southern portion of the county. Within the zone of transition from one to the other there is no clearly marked line of separation, the two series of soils presenting numerous characteristics in common. While the Susquehanna soils have not generally proven especially adapted to the cultivation of desirable qualities of tobacco, there are areas, as above mentioned, that could no doubt be utilized profitably in growing this particular crop.

Of the general farm crops cotton and corn are chiefly grown, cotton yielding from one-third to one-half bale per acre and corn from 15 to 30 bushels, depending on the rainfall during the growing season. The chief requirement of the soil is organic matter, and the planting of cowpeas every two or three years in rotation with the other crops would result very beneficially. The cowpeas should be plowed under after the peas have been harvested.

The Orangeburg fine sandy loam in its virgin state is worth from \$5 to \$20 an acre, and when improved from \$10 to \$30, according to local conditions.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of this type:

Mechanical analyses of Orangeburg fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
16701.....	Soil.....	0.2	0.2	0.2	60.2	28.2	7.0	3.5
16702.....	Subsoil.....	.0	.0	.1	37.1	28.7	3.8	29.5

ORANGEBURG FINE SAND.

The Orangeburg fine sand, to a depth of from 18 to 36 inches, is a gray to grayish-brown medium to fine sand, generally loose and incoherent, though at times quite loamy. The subsoil generally is a red sandy clay, though where the surface soil extends to a depth of 30 inches it may be a clayey sand to 36 inches, at the same time showing a grayish-red color. The surface soil is a little darker in color for the first few inches on account of the presence of organic matter. This is more noticeable in the uncultivated areas, as is also the fact that the soil often becomes very compact. Cultivation of this type is comparatively easy, however, as the soil naturally has a loose, open structure, a rolling topography, and good drainage.

The Orangeburg fine sand occurs chiefly in the northeastern section of the county along with the Norfolk fine sand about 6 miles northwest of Paige, though many small areas are scattered about

irregularly in connection with the Orangeburg fine sandy loam. The undulations of the type are nowhere severe and cultivation can be carried on over the extent of its occurrence. Drainage is correspondingly good and only the lower lying areas adjacent to stream courses are subject to excessive moisture conditions. These areas are protected, however, by the stream channels, as they are quite deep and afford an immediate outlet for all excessive rainfall.

The type has the same origin as the Norfolk fine sand, the discriminating difference between the two being chiefly the depth of the surface soil. There may also be slight differences in color and structure. The Orangeburg fine sand is sometimes a grayish red, with a more loamy nature due to heavier material, and the depth of soil varies from 18 to 36 inches, while the Norfolk fine sand is a grayish light, loose, medium to fine sand and always 36 inches deep.

Like all open-structured sandy soils the virgin productiveness of the Orangeburg fine sand declines rapidly. When first cleared, cotton will yield from one-third to one-half bale per acre and corn from 20 to 30 bushels. Green manuring is essential for increased and sustained productiveness.

The type is better adapted to special lines of agriculture than to general farming; fruits, melons, potatoes, peanuts, and various truck crops are produced in abundance for home consumption, and they could no doubt be as successfully grown on a commercial basis. The value of this soil is from \$8 to \$25 an acre, according to local conditions.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of this type:

Mechanical analyses of Orangeburg fine sand.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
16695.....	Soil.....	0.0	1.7	5.2	48.8	24.0	17.3	2.3
16696.....	Subsoil.....	.2	1.4	4.8	47.4	24.7	18.2	2.5

LUFKIN SANDY LOAM.

The soil of the Lufkin sandy loam, to a depth of from 24 to 36 inches, consists of medium to fine gray to brownish-gray sand to loamy sand. Some areas may be a loose and incoherent sand, similar in surface appearance to the Norfolk fine sand, while other areas may show a heavier structure, containing some finer material and approaching a sandy loam. The subsoil, which occurs at from 24 to 36 inches, is a mottled gray and yellow to gray sandy clay and is quite impervious. Occasional areas may show a subsoil streaked with red. The line of separation between the soil and subsoil is quite distinct,

though for a few inches the subsoil is more a clayey sand, quickly passing, however, into the impervious sandy clay. This is a light soil and easily cultivated.

The Lufkin sandy loam nowhere occurs in extensive areas, its appearance being more or less frequent in small areas in any of the sand or sandy loam types. It is found generally in the more level stretches or depressions where drainage is deficient, though not invariably in that position. Its occurrence is in the central part of the county, chiefly, and its extent is approximately 8 square miles.

This type is derived from the underlying formations, the lower lying areas, however, presenting material that has been brought down from the surrounding elevations. Appearing chiefly in the region of the Susquehanna fine sandy loam, the origin is from the sands, sandstones, and stiff clays of Eocene Tertiary time. A poorer aeration, due to position and the impervious nature of the clay subsoil, no doubt accounts for its dull yellow and gray mottled or solid gray color.

Some of the type is under cultivation, but the greater proportion of it still remains in its native state and supports a growth of post oak. Cotton and corn are the chief crops grown, cotton producing about one-third of a bale per acre and corn from 12 to 25 bushels. The type would show better results if drainage were properly handled and the soil given a system of crop rotation, including a growth of cowpeas every two or three years. It is better adapted to peanuts, melons, potatoes, and vegetables than to general farming. The growing of early truck on the lower lying areas is not recommended, as the colder air has a tendency to flow into these places. It has a value of from \$10 to \$20 an acre, according to local conditions.

The following table gives the average results of mechanical analyses of samples of this type:

Mechanical analyses of Lufkin sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
16677, 16679.....	Soil.....	1.4	10.7	13.8	40.3	11.7	18.3	4.1
16678, 16680.....	Subsoil.....	1.2	7.8	7.7	27.3	7.7	19.3	28.6

LUFKIN FINE SANDY LOAM.

The soil of the Lufkin fine sandy loam, to an average depth of 15 inches, is a medium to fine sandy loam, containing in localities a small percentage of gravel. Both the texture and the color may vary to some extent in different positions. The fine sandy loam on the level stretches is characteristic, while the slopes or areas adjacent to streams may show a loamy fine sand. The presence of a

larger supply of organic matter, depending generally on topographic features, gives this particular soil a darker gray color. On the better drained and better aerated areas, where oxidation has been more active, the soil may have a reddish to grayish-red tinge. The surface material of this type varies in depth from 4 to 20 inches, though the average is about 15 inches. On the higher divides, in the north-eastern section of the county, where erosion has been active, the soil is only a few inches deep and shows a reddish color, while some of the lower lying areas may show a depth of 20 inches. The subsoil of this type is generally a stiff, impervious, mottled yellow and gray sandy clay, the sand content being from medium to fine.

There are variations in the color of the subsoil, due no doubt to local conditions of drainage, aeration, and oxidation. The more rolling areas of the Lufkin fine sandy loam will often show a stratum of dark reddish to reddish-brown sandy clay a few inches in thickness immediately underneath the surface soil. This stratum of subsoil immediately passes into the gray or mottled yellow and gray sandy clay. The uniform darker gray color is found in the more level stretches where drainage is defective and where the surface soil is from 10 to 20 inches deep. The line of separation between the soil and the subsoil is generally quite distinct. Cultivation over the type is comparatively easy, except on areas of poor drainage.

The Lufkin fine sandy loam is found only along the eastern edge of the county, where it occurs irregularly, often extending as finger-like projections back into the county along the more level or valley-like depressions carrying stream courses. The topography of the type is gently rolling to level, with the rolling areas generally adjacent to other types of soil. There seems to be a gradual decline to a more level country as the type passes out of the county. Drainage over a great part of the areas is very good, as the topography is sufficiently rolling to prevent water-logging. The more level areas, however, would be benefited by open ditches, for the excess of moisture due to heavy rainfall is likely to be held in the soil by the impervious clays beneath. Though this soil is fairly retentive of moisture, where drainage is good crops often suffer from drought during the summer months. The moisture supply, which is generally drawn from the clays beneath by crops during dry seasons, is greatly reduced by the impervious nature of the subsoil.

The Lufkin fine sandy loam is derived from the weathering of sands, sandy clays, and shaly clay formations of the Jackson stage of Eocene Tertiary time.

For general farming the Lufkin fine sandy loam gives fair yields, cotton producing from one-fourth to one-half bale per acre and corn from 12 to 25 bushels. A large percentage of the type is still in its virgin state, supporting a timber growth of post and black-jack oak. When

first cultivated the soil is productive, but its fertility is soon reduced under the continual cultivation of cotton and corn. Peanuts do well, though they are grown only for home consumption and as pasturage for hogs. Fruits, melons, potatoes, and vegetables could no doubt be grown very profitably.

In the production of crops on this type of soil, the addition of organic matter, supplied as stable manure or as green manure, would result very beneficially. It has a value of from \$10 to \$30 an acre according to local conditions, the average prices being about \$15.

The following table gives the average results of the mechanical analyses of both the soil and subsoil of this type:

Mechanical analyses of Lufkin fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
16248, 16687.....	Soil.....	0.7	1.2	1.0	39.4	22.2	29.7	5.4
16249, 16688.....	Subsoil.....	.3	1.1	.4	16.8	10.4	27.1	43.3

LUFKIN GRAVELLY LOAM.

The Lufkin gravelly loam is composed of 1 inch to 14 inches of fine earth, gravel, pebbles, and stones. The fine earth is chiefly a medium to fine gray sand, though in some instances it may be much heavier. The color may also be a reddish to yellowish gray where the subsoil is near or at the surface. The gravel content is always high and may be on the surface, in the surface soil, or from 6 to 10 inches beneath the surface. In this last position, the appearance of the type is similar to the Lufkin fine sandy loam. It occurs generally on the more level lower lying areas and is no doubt due, at least in part, to material that has been transported from the higher elevation and deposited over the gravel. The subsoil, where borings could be made or where it could be seen along washes, is a heavy grayish to yellowish or reddish sandy clay, the latter color predominating. Local spots are found where erosion has removed the finer materials, leaving the clay subsoil supporting the rounded rock fragments.

The type occurs along the eastern side of the county, associated with the Lufkin fine sandy loam, many areas of varying extent being mapped both north and south of Paige. It occupies generally the higher hills between the stream courses, though it has no regular occurrence. Areas may extend even to the streams or over stretches that are comparatively level. The type is of little agricultural value and, except in a few instances where the gravel content is sufficiently low to permit cultivation, it supports a timber growth of scrubby oak and is utilized as pasturage. A few of the more level areas are

cultivated with fair results. The topography is rolling to hilly and drainage is exceptionally good.

The soil is derived from sandy clay beds and shaly clays of Eocene Tertiary time. The rounded, waterworn gravel would indicate it to have been influenced by water action. Its position in relation to the sandy divide immediately to the west would support the theory of its having been an ancient shore line. The average yield of cotton is from one-fourth to one-half bale per acre, and of corn from 12 to 20 bushels. The type has a value of from \$5 to \$20 an acre, according to local conditions.

The following table gives the results of mechanical analyses of fine-earth samples of both the soil and the subsoil of this type:

Mechanical analyses of Lufkin gravelly loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
16250.....	Soil.....	5.3	4.0	1.1	10.4	13.1	57.5	8.5
16251.....	Subsoil.....	2.7	1.2	.2	1.9	2.8	39.8	50.7

LUFKIN FINE SAND.

The Lufkin fine sand, to a depth of about 8 inches, is a grayish fine sand to loamy sand, containing some organic matter, and underlain to a depth of 30 inches by a lighter, grayish, loose and incoherent fine sand to loamy sand, which in turn is underlain by a mottled gray and yellow impervious sandy clay to a depth of 3 feet. Areas of the type were encountered where the loamy sand extended to a depth of 3 feet or more, with the characteristic clay occurring at lower depths. Occasionally the surface soil contains a noticeable quantity of small gravel.

No extensive areas of the type were mapped. Several small bodies covering approximately 2 or 3 square miles were encountered, generally at the juncture of the rather level Lufkin soil with the more rolling Susquehanna fine sandy loam.

The topography is gently rolling to comparatively level and the drainage is generally good, though in several instances the type occupies depressions where drainage is poor. All such areas are uncultivated and support the native timber growth of scrubby post oak and black-jack. In the event of cultivation open ditches will be necessary to relieve the soil of excessive water during seasons of much rain. This soil is partially under cultivation and fair yields of cotton and corn are produced. Being a light soil, it is especially adapted to fruits, potatoes, peanuts, melons, and vegetables. These crops would no doubt do well. Like all light sandy soils, it is readily

reduced in productiveness and should be treated with crops affording a supply of organic matter. Cowpeas plowed under would increase the yields. This land commands a price of from \$10 to \$20 an acre.

The following table gives the results of mechanical analyses of the soil and subsoil of this type. The clay subsoil was encountered at 30 inches and an analysis of this would doubtless have been similar to the subsoil of the Lufkin fine sandy loam.

Mechanical analyses of Lufkin fine sand.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
16683.....	Soil.....	0.1	0.7	0.9	57.0	16.1	22.5	2.8
16684.....	Subsoil....	.2	.8	.8	54.3	19.4	18.4	5.5

WILSON LOAM.

The soil of the Wilson loam, to a depth of 9 inches, is a heavy dark-gray loam, containing a small percentage of fine sand and some organic matter. The subsoil is a mottled red, yellow and gray or drab clay, grading into a stiff, dirty-yellow clay containing a perceptible quantity of fine sand. The type is quite heavy and must be handled with some care to insure a good tilth.

It is found in the eastern part of the county, in a single area, some 2 miles northwest of the cornering of Fayette, Lee, and Bastrop counties. It has an extent of about 2 square miles. The type has a very gently rolling to level topography and occupies a position between the Houston black clay and the Lufkin fine sandy loam. Drainage is good, except on the more level areas where open ditches would result beneficially.

The soil is no doubt a gradation type between the formation underlying the Houston black clay and that underlying the Lufkin fine sandy loam. The surface soil possesses characteristics which would evidence a mantle of the formation giving the Lufkin soils to have been placed over the formation giving rise to the Houston black clay, the subsoil showing much resemblance to the subsoil of the black clay type.

The Wilson loam is more or less easily cultivated and very productive, cotton producing from one-half to three-fourths of a bale per acre and corn from 20 to 40 bushels. Cotton is the chief crop and is grown without the use of any fertilizers. The type would no doubt produce good yields of all crops adapted to the climatic conditions. The uncultivated areas support a natural growth of elm, mesquite, and post oak and offer good pasturage of native grasses. The land is valued at about \$30 an acre.

The following table gives the results of the mechanical analyses of the soil and subsoil of this type:

Mechanical analyses of Wilson loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
16681.....	Soil.....	0.3	0.7	0.4	12.7	22.0	46.3	17.2
16682.....	Subsoil.....	.4	.5	.4	7.9	12.2	42.0	36.2

NORFOLK FINE SAND.

The Norfolk fine sand consists of about 7 inches of loose and incoherent gray to whitish-gray medium to fine sand, underlain by a material of practically the same structure and texture, but showing a yellowish-gray color. The organic matter contained in the first few inches gives the surface soil a grayish hue. This sand is always over 3 feet deep. On the more level areas the soil becomes quite compact, as is true of the entire type when wet. The most of the soil is in its virgin state, and supports a native growth of scrubby post and black-jack oak, with a fair grade of pine growing on the southern areas.

The Norfolk fine sand is found scattered throughout the central section of the county and in the south-central section around Rosanky. There is also a rather broad area in the neighborhood of Sayersville. It is found extensively and almost continuously as a stretch of sand-hills several miles broad and extending in a southerly direction as a divide from the "Yegua Knobs" in the north almost to the Colorado River, where it gives way to a series of gravelly ridges or hills which skirt the river valley. In the southern section, around Rosanky, the extensive areas show a trend of direction in line with the areas north of the river. The entire topography is more or less rolling and drainage is excellent. It is fairly retentive of moisture and when first cleared produces fair yields of cotton.

The Norfolk fine sand is of early Tertiary time and no doubt represents the sandy beaches of ancient shore lines. The long subjection to weathering has probably affected these sands, though there is no evidence that a great part of the type has ever been less loose and incoherent than to-day. Some areas of the type, however, hold such a relation to the underlying material that there can be little doubt that it is a derivative. These areas occur on hills or ridges which are composed of a fine-grained sandstone. The finer material resulting from the weathering of this sandstone has been washed to lower elevations, leaving the loose and incoherent sands as they are found to-day.

Much of this type might be profitably cultivated to fruits, melons, grapes, and vegetables for early market, the addition of much organic matter, either as stable or green manure, being of course essential. The available supply of moisture in this soil is greatly conserved by the natural sand mulch which exists during the dry seasons, evaporation being greatly checked. Watermelons do well and many are shipped yearly to distant markets. General farming is limited over the type; only a few areas occupying valleys and containing somewhat more fine material are devoted to cotton, corn, and sorghum, and here with only fair results. This soil has a value of from \$4 to \$12 an acre.

The following table gives the results of mechanical analyses of samples of this type:

Mechanical analyses of Norfolk fine sand.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
16691.....	Soil.....	0.1	0.3	10.3	73.6	7.4	6.9	1.1
16692.....	Subsoil.....	.1	2.9	8.9	73.8	7.1	5.9	.8

SUSQUEHANNA GRAVEL.

The Susquehanna gravel, to a depth of from 6 to 20 inches, consists of sand, gravel, and cobble stones intimately mixed together and carrying a noticeable quantity of the finer grades of material. The gravel content is always high and the type has at present little value for agricultural purposes, save as timber land and pastures. The subsoil is generally a heavy red sandy clay, which at times, however, may show a brownish color. It also may contain beds of rounded gravel which usually occur from 2 to 20 feet below the surface. These beds, cemented together with the heavy red clay, may be several feet thick.

Many areas of varying extent are found where the finer material has been washed from the surface, leaving the stones resting on the underlying clays. Such areas constitute the gravelly clay phase of the type. The surface material of this phase may often show from 2 to 4 inches of fine earth and gravel, though generally erosion has been sufficiently effective to remove most of the fine material. Like the type, this phase has little agricultural value, except possibly over a very few small areas where the gravel content is sufficiently low and the topography sufficiently level to permit cultivation. There is another distinct phase of the Susquehanna gravel which consists of 3 feet or more of coarse to fine sand intimately mixed with rounded gravel, the fragments of varying sizes, though seldom exceeding three-fourths to 1 inch in diameter. This material rests on a red clay foundation and occurs in one small area adjacent to the river in the southeastern section of the county and in several small areas in the same position in the

western section. It occurs in the immediate vicinity of the junction of the bottom lands with the uplands. This phase has little agricultural value and occupies about 2 square miles all told.

The occurrence of the type is almost wholly on the high, rough ridges which flank the course of the Colorado River and often extend several miles back from the valley. The extensive areas show numerous small valleys threading their ways among the many ridges and hills, and it is in the lowest elevations of these valleys that is found the sandiest surface soil, as the sands and finer material have been washed to these positions from the ridges and slopes.

The Susquehanna gravel represents material that has been re-worked by river action in early days. The abundance of rounded gravel indicates a rolling due to water action, and the material was no doubt brought down from higher elevation and deposited along the course of the river with much of the finer material. Erosion has greatly influenced the original conditions, giving rise to the present aspects of the areas.

The chief value of the entire type is the timber growth of hardwood and pine growing thereon, much of which is being handled on a commercial scale. The land has a value of from \$4 to \$30 an acre, though occasional areas supporting a better grade of timber may sell at a much higher price.

The following table gives the results of mechanical analyses of the fine earth of soil and subsoil of the Susquehanna gravel:

Mechanical analyses of Susquehanna gravel.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
16252.....	Soil.....	3.6	2.6	1.5	43.7	19.3	24.2	5.2
16253.....	Subsoil.....	.8	1.5	.4	9.4	8.9	16.8	61.5

BASTROP CLAY.

The Bastrop clay to a depth of 6 to 10 inches is a dark-gray clay loam to heavy clay, underlain to 36 inches by a dark-gray to dark-brownish compact and plastic clay. Both soil and subsoil contain large amounts of silt and some organic matter. This type represents the heaviest soil of the Colorado River bottoms, being heavier in the depressions or along slightly depressed stream courses, which extend from the uplands to the river channels. When wet, the soil is very sticky and it bakes quite hard on drying, necessitating a careful and attentive cultivation in order to secure the best results. It should not be plowed too soon after a rain or when too wet, for in that condition it breaks into clods which bake very hard, thus preventing a

desirable tilth as well as diminishing the productiveness. It can not be plowed when very dry, as it is too hard. Continual cultivation at the proper time renders it a friable soil of excellent tilth, the heaviest phase being the most difficult to handle.

The type is an alluvial soil and occurs irregularly in areas of varying sizes along the Colorado River bottoms. The topography is comparatively level, with occasional swells or gentle depressions, and the drainage is not exceptionally good. Crops are seldom damaged, however, by reason of excessive moisture. The gentle slope toward the river affords an easy flow for any excessive rainfall. Some of the type is subject to overflow, though no apprehension is felt from this source over the cultivated areas. The depressions or level stretches are greatly benefited by surface ditching.

The Bastrop clay is derived from material which no doubt represents the finer silt and black clay of the prairie uplands, which have been eroded and washed into the river and deposited from the slowly moving waters during seasons of extensive overflow. It contains much organic matter, and is probably the strongest soil of the bottom types. General farming is practiced over the type, cotton, corn, and sorghum being the chief crops grown. Cotton produces from one-half to three-fourths of a bale per acre, corn from 25 to 50 bushels, and sorghum from $1\frac{1}{2}$ to $2\frac{1}{2}$ tons. Small areas of the type are given to alfalfa, which seems to do fairly well. It is better suited for corn than for cotton, cotton showing better returns on the lighter type of the bottom soils. This land has a value of from \$20 to \$40 an acre.

The following table gives the results of mechanical analyses of the soil and subsoil of this type:

Mechanical analyses of Bastrop clay.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
16153.....	Soil.....	0.0	0.6	0.4	2.9	7.5	59.2	29.5
16154.....	Subsoil.....	.2	1.0	.4	6.6	10.8	50.8	31.1

The following samples contained more than one-half of 1 per cent of calcium carbonate (CaCO_3): No. 16153, 4.63 per cent; No. 16154, 15.75 per cent.

BASTROP FINE SANDY LOAM.

The Bastrop fine sandy loam consists of 6 to 12 inches of dark-brown medium to fine sandy loam, underlain by a brown fine sandy clay which becomes lighter in color and heavier in texture as the depth increases. Both the soil and the subsoil contain varying quantities of silt, the surface soil often approaching a silt loam. On the more level or slightly depressed areas a heavier texture is found, while the gentle swells or terraces present a lighter phase.

This is one of the most extensive types found along the Colorado River. Having a rather loose structured surface soil, with very good drainage and being little subject to overflow, it is easy to cultivate and a very desirable soil for general farming and trucking. In places the areas run to the river front in a gradual decline, and overflows often occur in these particular places, but generally the river channel has been cut from 20 to 50 feet below the surface, thereby preventing the possibility of extensive inundations. Only once or twice in the memory of the oldest inhabitants have the bottoms in general been flooded.

The topography of the Bastrop fine sandy loam is comparatively level, with swells and depressions that are characteristic of old river bottoms. The drainage is generally good, with some depressed areas, however, demanding surface ditching.

The type is an alluvial soil, having been deposited by the river waters. The heavier clay subsoil no doubt represents the finer material that was originally taken into suspension while the river was cutting its channel through the hills above, and deposited over the broad lowlands during flood time. Later inundations have deposited the sands and silts forming the surface soils.

The Bastrop fine sandy loam is one of the most productive river-bottom soils, and adapted to a wide range of crops. It is quite retentive of moisture, though crops suffer sometimes from drought. While this condition can be remedied to some extent by the adoption of proper cultivative methods looking to the conservation of the soil moisture, it can not be so relieved for the extensive growing of truck. Its position makes possible a feasible plan of irrigation, however, which would result in attaining the highest possibilities of agricultural development. Cotton produces from one-half bale to 1 bale per acre, corn from 35 to 60 bushels, and sorghum from 2½ to 4 tons of forage. Oats give a hardy growth and are generally cut and fed in the straw. Alfalfa is grown on a limited acreage and gives very profitable yields. Pecans are indigenous to the soils of the Colorado River bottoms and no doubt their production on a commercial basis would become very profitable. This type is valued at from \$35 to \$70 an acre, according to location and local conditions.

The following table gives the average results of mechanical analyses of samples of this type:

Mechanical analyses of Bastrop fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
16315, 16666.....	Soil.....	0.1	2.2	4.4	28.8	19.5	33.5	11.1
16316, 16666.....	Subsoil.....	1	1.8	3.3	20.4	19.7	32.9	21.3

The following sample contained more than one-half of 1 per cent of calcium carbonate (CaCO_3): No. 16666, 6.5 per cent.

BASTROP SILT LOAM.

The Bastrop silt loam is a heavy brown silt loam 12 inches deep, underlain to a depth of 36 inches or more by a brown silt loam to silty clay, quite compact and heavy and somewhat darker in color than the surface soil. Both the soil and subsoil often show an abundance of small shell fragments, which occasions the local name of "shell lands." This is the second heaviest bottom type and generally occupies a position adjacent to the stream, or on rather level first terraces. The type when uncultivated becomes very compact and on drying cracks slightly. When properly handled, however, it is a loose, friable soil, very productive and desirable for general farming. Some small areas occurring along the immediate overflow lands are utilized for pasturage, as crops are easily flooded and damaged. Most of the soil is above the overflow mark and has very good drainage. Cultivation is comparatively easy.

This is an alluvial soil and represents deposits of silts and clays laid down during seasons of overflow. Occasional spots are found showing beds of sand at from 2½ to 5 feet below the surface, indicating that the silt and clay have been deposited over sandy material laid down by the river waters at an earlier stage.

The Bastrop silt loam is devoted chiefly to the growing of cotton and corn; cotton producing from one-half to 1 bale per acre and corn from 30 to 50 bushels. Oats are produced to some extent but very few are thrashed. Several small areas are given to alfalfa, which seems to be doing well, and no doubt this crop could be successfully grown over a large part of the type. Melons and potatoes give excellent yields. Pecans are indigenous to this type, as well as to the other bottom soils. While the soil is naturally productive and gives good returns, much larger yields could be secured with more attention to cultivation and improved methods generally.

The largest body of this soil is found in the western edge of the county and extending back for several miles along the river valley. It has a value of from \$30 to \$60 an acre.

The following table gives the results of the mechanical analyses of both the soil and subsoil of this type:

Mechanical analyses of Bastrop silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
16238.....	Soil.....	0.2	0.4	0.1	0.4	8.1	79.3	12.1
16239.....	Subsoil.....	.0	.3	.0	.5	12.9	72.0	13.9

The following samples contained more than one-half of 1 per cent of calcium carbonate (CaCO_3): No. 16238, 21.60 per cent; No. 16239, 25.70 per cent.

BASTROP SANDY LOAM.

The Bastrop sandy loam to a depth of from 10 to 24 inches is a grayish brown to reddish-brown light sandy loam. The sand content varies from coarse to fine with the medium to fine texture predominating. The subsoil to 36 inches is a reddish to dark-reddish sandy clay, the lighter color occurring on the more elevated and better drained areas.

The type is found irregularly over the river bottoms, occupying the higher swells or last terraces as the bottoms give way to the uplands. Adjacent to the uplands the structure of the soil is looser and the subsoil presents its lightest color, being a red sandy clay. There are several comparatively level areas of the type which run to the edge of the river, ending in a steep escarpment from 25 to 60 feet above mean water level. This is clearly defined at Smithville, where the river has cut a deep channel, and the bluff on the south, rising abruptly some 60 feet, reaches the level bottom lands, which extend from the river a mile or more, giving an extensive area of Bastrop sandy loam. The depressions therein, however, may show areas of Bastrop clay or Bastrop fine sandy loam. The topography of the type in general is very rolling and drainage is good. The soil being loose and open textured, cultivation is quite easy.

This type of soil is the oldest of the alluvial bottoms. Occupying as it does, the highest swells and terraces of the alluvial area, much of the finer material has been washed to lower elevations, leaving a more open-structured and sandier surface soil. The red sandy clay subsoil no doubt represents material of the old Permian Red Beds, which has been reworked by river action.

The Bastrop sandy loam is adapted to the cultivation of cotton and corn, though corn gives better results on the lower types. Cotton produces from one-half to three-fourths of a bale per acre and corn from 25 to 35 bushels. The type is especially well adapted to the cultivation of truck. Small fruits, grapes, melons, sweet and Irish potatoes, and various vegetables can be grown on a commercial scale. Many small areas in the neighborhood of Smithville are devoted to these crops to supply in part local demands.

The addition of green manures and stable manures is essential for any maintained productiveness. This is the lightest of the alluvial soils and occasionally shows 3 feet of mellow sandy loam material. It is a warm soil and capable of being brought to a high state of productivity. It carries a value of from \$25 to \$75 an acre, depending on location and local conditions.

The following table gives the results of the mechanical analyses of the soil and subsoil of this type:

Mechanical analyses of Bastrop sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
16661.....	Soil.....	0.2	3.8	10.3	43.1	16.5	18.8	6.3
16662.....	Subsoil.....	1.0	4.0	6.0	26.4	16.3	23.1	22.4

CROCKETT LOAM.

The Crockett loam, to a depth of from 8 to 12 inches, is a dark-gray loam to clay loam, quite heavy and containing some fine sand, organic matter, and occasionally a small percentage of rounded, waterworn gravel. The subsoil, to a depth of 36 inches, is a mottled yellow and gray and red sandy clay. The sand content is from medium to fine, and the red color may be in streaks. The soil is easily handled, shows a good tilth, and is at the present time practically all under cultivation.

Its occurrence is in the eastern section of the county, in three small areas, approximately 1 square mile in extent. It occupies comparatively level slopes adjoining stream courses, though the decline to the stream is sufficient to insure good drainage.

The type shows evidence of having been derived from the intermingling of some of the Houston black clay material of that section with the surrounding types. Probably small isolated areas of the material constituting the old San Antonio prairie, which have been greatly modified by the surrounding formations, are represented by the appearance of these small areas of Crockett loam. The type is very closely related to the soil mapped as Wilson loam.

The Crockett loam is a very productive soil and is devoted to the cultivation of cotton and corn. In crop yields it has practically the same value as the Wilson loam.

CROCKETT CLAY LOAM.

The soil of the Crockett clay loam, to a depth of from 8 to 12 inches, is a dark reddish-brown clay loam, containing some rounded gravel, iron concretions, and fragments of rock. The surface soil is not uniform in color, but has a spotted appearance. The subsoil is a mottled red, yellow and drab or gray clay loam to clay, containing, as does the soil, rounded gravel, fragments of rock, and an appreciable percentage of fine sand. The rock fragments found in both the soil and the subsoil are probably an impure limestone or sandstone carrying iron.

The type, though not easily cultivated, is a rather strong soil and gives good yields. It occurs in a single area in the east-central sec-

tion of the county, just south of Cottle town settlement, where it occupies well-rounded knolls and gentle slopes. Drainage is good. The type is surrounded by various sandy soils with a small area of Wilson clay loam capping a level-topped hill directly in line with its occurrence. This soil is no doubt derived from some calcareous material which has been greatly influenced by the surrounding formations. It is devoted to the general farm crops with good results.

WABASH CLAY.

The Wabash clay consists of a dark-brown to black clay loam to clay 12 inches deep and underlain to 36 inches by a stiff heavy clay of somewhat lighter color than the surface soil. The only area mapped is in the western section of the county, where it occurs as a narrow strip along the banks of Cedar Creek. The surface is comparatively level, with gentle swells and depressions. These depressions often hold water after rains, but the type is not subject to overflow.

The type is alluvial in origin and is derived from the clay and silt that have been washed from the black prairies into the creek and deposited along the flat areas adjoining the stream course. The soil contains much organic matter and is devoted to the growing of the general farm crops with good results.

This soil is a continuation of that mapped as Yazoo clay in the Austin area, its extent in this county being so limited as to make it of very little importance.

MEADOW.

The type mapped as Meadow includes soils varying in texture, color, and structure, which occupy narrow marginal strips along some of the smaller stream courses of the area, and occur at intervals along the course of the Colorado River. The soils are composed entirely of material that has been washed down from the surrounding elevations and material transported by drainage waters and stream action. While this type varies in characteristics, it is principally of a very sandy material, generally over 3 feet deep. The types of soil in the immediate vicinity determine largely the character of the material found along the banks of the stream.

Comparatively little of this type is overflow land, the stream channels having been cut sufficiently deep to prevent overflows even during seasons of excessive rainfall. A classified separation of this transported material was impossible, and it was only on the more extensive areas, which presented some uniformity, that it was attempted. The type is in a few instances a clay, or a loam, but generally it consists of a sand to a sandy loam. In almost every instance along the Colorado River it is a sand to a loamy sand, occupying the immediate overflow land and deposited as natural levees by the river waters.

None of the type along the river is cultivated, even though its position may now be above the high-water mark. It is utilized as pasturage, affording a luxuriant growth of native grasses. A part of the type along the smaller streams is under cultivation and gives good yields. These areas are usually an extension of the immediate overflow land and the soil is properly Meadow.

The type being variant in many features is classified broadly, position and manner of formation being the chief factors in making the separation. The cultivated areas are quite productive, devoted to the growing of cotton and corn generally, and command a value of about \$25 an acre.

SUMMARY.

The Bastrop County area, comprising 917 square miles, is situated in south-central Texas. It is almost wholly an agricultural community, showing, however, a few industrial enterprises in coal mining, brickmaking, and lumber. It has a cosmopolitan population and a sound agricultural and commercial prosperity, with Bastrop, Elgin, and Smithville as the chief centers. The elevation of the area is from 375 to 600 feet above sea level and the general topography is rolling. Some local areas are quite hilly, however, while others are comparatively level. Drainage is generally good.

The intensity of settlement throughout the county is determined largely by the productiveness of the soil and the convenience of market facilities, though most of the area is fairly thickly settled. The average size farm is about 110.9 acres. The uncultivated lands, which are mostly untillable, are utilized as pasturage for stock, though stock raising has ceased to be an extensive industry.

Two systems of railroad traverse the area, the Houston and Texas Central, from east to west in the northern part, and the Missouri, Kansas and Texas from north to south through the central part. These roads afford transportation facilities sufficient to meet all demands.

The climate is equable and mild, being subject to the moderating influences of the Gulf breezes. The average annual rainfall is about 33 inches and is fairly well distributed throughout the year, though occasional droughts occur during the summer months. Irrigation is not practiced, but is feasible over the extent of the Colorado River Valley. Most of the small streams are generally dry in summer, necessitating the collection of the winter rains in reservoirs, or "tanks," for use of the stock during the dry seasons.

The chief agriculture of the area consists in the production of cotton, with corn, oats, sorghum, fruits, melons, potatoes, cowpeas, alfalfa, and various vegetables grown in sufficient quantities for local demands. Large quantities of watermelons are shipped yearly to

northern markets. No system of crop rotation or of general improvement is practiced broadly and no fertilizers are ever used in maturing crops. The productiveness of the strong alluvial soils and the black prairie clays has been little affected by cropping, and good yields are continuously obtained, but the lighter sandy areas under such a system are soon reduced to a low-producing capacity.

Farm labor is composed chiefly of Mexicans and negroes, at an average price of from \$18 to \$20 a month, and is usually abundant. Day labor is paid \$1 on an average. Cultivation of the lands is done by the owners, or by tenants on a share or cash basis which is equivalent to about \$3.50 an acre. Something over 37 per cent of the farms are operated by owners.

There is a diversity of soils sufficient to accommodate all crops adapted to climatic conditions, 23 types having been established. These vary in structure and texture from a stiff heavy black clay to a loose and incoherent white sand. In the fact of crop adaptation lies the secret of a more progressive agriculture. The value of these soils is determined largely by conditions of productiveness, ease of cultivation, drainage features, and location. They range from the untillable gravelly hills and ridges to the fertile undulating clays and loams of the prairies and the river bottoms, and carry a value of from \$4 to \$80 an acre.

The Houston black clay is the strongest and most productive of the upland soils, yielding continuously without fertilization from one-half bale to 1 bale of cotton per acre and from 30 to 60 bushels of corn. Oats and sorghum do well and are more or less extensively grown for forage. Drainage over the type is good and a careful cultivation renders it a friable soil of good tilth. It has a value of from \$30 to \$75 an acre.

The Houston gravelly clay, while not so productive as the Houston black clay, is a valuable soil, yielding about one-half bale of cotton per acre and from 25 to 35 bushels of corn. Corn shows better yields when a good rainfall is distributed throughout the growing season. Oats, sorghum, and truck for home consumption are grown successfully. The gravel content is often sufficiently high to prevent cultivation. The topography is quite rolling and drainage is excellent. The type carries a value of from \$10 to \$35 an acre.

The Houston loam is a valuable soil for general farming, being easily handled, quite productive, and adapted to a variety of crops. Cotton yields on an average one-half bale per acre, corn from 15 to 30 bushels, oats from 15 to 30 bushels, and sorghum from 2 to 3½ tons. Potatoes and vegetables are successfully grown in limited quantities. Proper fertilization would give the type a still higher productiveness. The land is rolling and drainage is good. The average value is \$25 an acre.

The Houston series of soils, constituting the "black lands" of the prairie sections, are recognized as the most valuable of the area. Cultivation is always profitable and the uncultivated areas afford excellent pasturage, supporting as they do a luxuriant growth of mesquite, prickly pear, and native grasses.

The Susquehanna fine sandy loam, the predominating type of the area, is less productive than the Houston soils, but capable of a broad diversity of crops. Cotton is grown extensively and yields about one-third of a bale per acre. Corn, oats, and sorghum give fair to good yields, while potatoes, melons, peanuts, fruits, and vegetables do well. Tobacco is not one of the crops at present, but could no doubt be profitably grown in certain areas. The surface is rolling and drainage naturally good. Stable and green manures are essential for maintained productiveness, as the virgin fertility of the soil is soon exhausted. Uncultivated areas show a timber growth of hardwood. The land sells at from \$5 to \$20 an acre, according to local conditions.

The Lufkin sandy loam is subject to the same conditions as the Susquehanna fine sandy loam and has practically the same agricultural value.

The Orangeburg fine sandy loam is also a light soil adapted to a variety of crops. General farming can be practiced with fair to good results, but cowpeas, melons, fruits, peanuts, sweet potatoes, and probably tobacco are more adaptable crops. Peaches and all small fruits grown do well. The Orangeburg fine sand is a still lighter soil, less suited to cotton and grain, but well adapted to fruits, truck, and tobacco. The culture of tobacco has not been promoted, but experiments with this crop should be undertaken. These soils are of equal value, ranging from \$5 to \$25 an acre.

The Norfolk fine sand, occurring generally as sandy hills and ridges, is little suited for present agricultural pursuits, and almost its entire extent is covered by a growth of scrubby post oak and black jack, with some pine. Small areas are devoted to watermelons, and no doubt much of it might be profitably cultivated in melons, fruits, grapes, and vegetables, the addition of much organic matter being necessary.

The Lufkin fine sandy loam is probably less productive than any of the loamy soils, owing in part to the unyielding nature of the underlying impervious clays. The topography is level, and drainage, while generally good, is less active. The soil yields on an average one-third bale of cotton per acre and from 12 to 25 bushels of corn. Peanuts, melons, sweet potatoes, and vegetables do well. Much of the type is in its virgin state, supporting a timber growth of hardwood.

The Lufkin fine sand is the lightest soil of the Lufkin series and is adapted to light crops.

The Lufkin gravelly loam occurs on the higher ridges and is of little agricultural value, except where the gravel content is sufficiently low to admit of cultivation.

The Wilson loam is a productive soil and rather easily cultivated, cotton producing one-half to three-fourths bale per acre and corn from 20 to 40 bushels. This soil would no doubt produce good yields of all crops adapted to the climatic conditions. Uncultivated areas afford a good pasturage of mesquite and native grasses. The average value is about \$30 an acre.

The Susquehanna gravel occurs as a series of hills or ridges skirting the Colorado River Valley. The roughness of the topography and the high gravel content of the soil unfits it for agricultural purposes. Its chief value is the timber growth of hardwood and pine.

The Bastrop clay is the heaviest and strongest of the alluvial soils. Cultivation requires much care, and some of the type is subject to overflow. It is a productive soil, yielding on an average from one-half to three-fourths of a bale of cotton per acre and from 25 to 50 bushels of corn. It seems especially adapted to corn, 60 to 75 bushels being frequently produced. It has a value of from \$20 to \$40 an acre.

The Bastrop fine sandy loam is probably the most valuable of the alluvial types, as it is heavy enough for general farming and yet has a structure adapting it to a diversity of crops. The topography is undulating and the drainage good. Improvements in productivity are easily maintained and yields are always good. Cotton produces from one-half bale to 1 bale per acre, corn from 35 to 60 bushels, and sorghum from 2½ to 4 tons. Melons, potatoes, peanuts, and vegetables do exceptionally well. Alfalfa is grown in limited areas on the heavier phases. The soil has a value of from \$35 to \$70 an acre.

The Bastrop silt loam, an alluvial soil, is devoted to the cultivation of cotton and corn, with yields varying from one-half to 1 bale of cotton and from 30 to 50 bushels of corn per acre. Alfalfa is successfully grown on small areas. Melons and potatoes do well. Some of the type is overflow land and the whole is very productive. It sells for about \$40 an acre.

The Bastrop sandy loam is the lightest of the river-bottom soils and is especially adapted to melons and truck, though cotton and corn are extensively grown. Cotton yields from one-half to three-fourths bale per acre and corn from 25 to 35 bushels, the latter crop doing better on the lower lying types. Fertilization with stable and green manures is demanded on this soil. It occupies the high swells and last terraces of the alluvial area and drainage is good. It has

a value of from \$25 to \$75 an acre, according to location and local conditions.

Irrigation covering the extent of these alluvial soils along the Colorado River is possible, and if put in operation would result in increased yields of all crops and at the same time increase the value of diversification.

Several other types of minor importance were established in the area, resulting from modifying agencies in local areas of the more extensive soils. In the development of the county these will all ultimately be found of value in the production of special crops.

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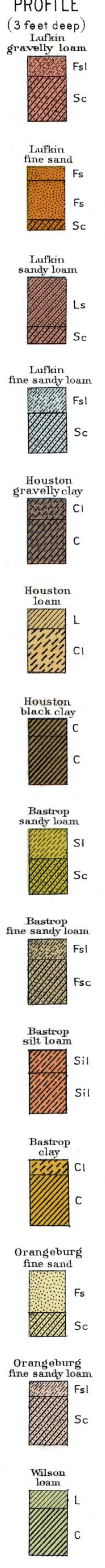
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SOIL MAP

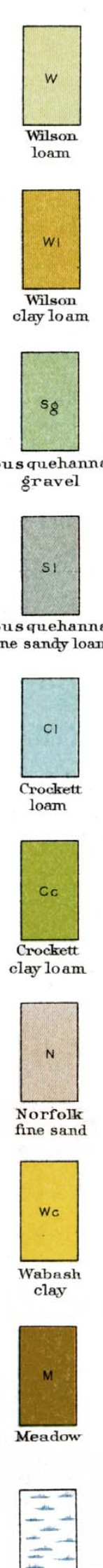
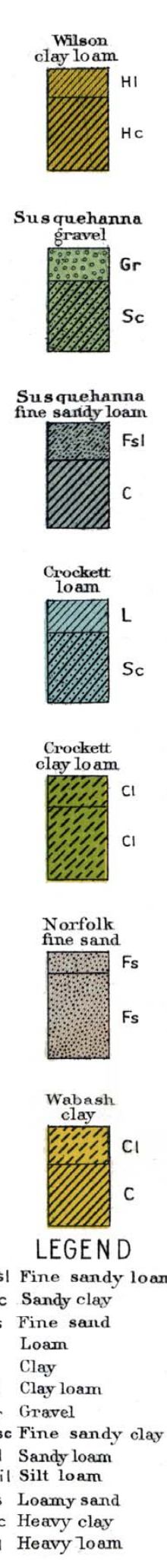
TEXAS
BASTROP COUNTY SHEET

U.S. DEPT. OF AGRICULTURE
BUREAU OF SOILS
MILTON WHITNEY, CHIEF

SOIL
PROFILE
(3 feet deep)



LEGEND



Soils surveyed by
R. A. Winton, F. A. Menden, G. L. Eckman,
W. S. Lyman, Frank C. Schaefer, Thomas G. Rice,
and 1907

Scale 1 inch = 1 mile
Contour interval 25 feet

Field Operations
Bureau of Soils
1907